

# Fall 2009 Math 151

## Week in Review XI

courtesy: David J. Manuel

(covering 5.1, 5.2, and 5.3)

### 1 Section 5.1

1. True or False—there exists a function  $f$  such that  $f(x) > 0$ ,  $f'(x) < 0$  and  $f''(x) > 0$  for all  $x$ . If true, sketch it; if false, explain why not.
2. Sketch the graph of a function which satisfies the following:
  - $f(2) = 1$
  - $f'(x) < 0$  for  $x < 2$
  - $f'(x) > 0$  for  $x > 2$
  - $f''(x) < 0$
3. Maplets: “Properties of a Graph of a Function/First Derivative/Second Derivative” located at <http://calclab.math.tamu.edu/maple/maplets>

### 2 Section 5.2

1. Find the absolute maximum and absolute minimum of each of the following:
  - (a)  $f(x) = \sqrt{6x - x^2}$
  - (b)  $2 \sec x - \tan x$  on the interval  $\left[0, \frac{\pi}{4}\right]$
  - (c)  $f(x) = x^2 e^{-x}$  on the interval  $[1, 4]$
  - (d)  $f(x) = \frac{\ln x}{x}$  on the interval  $(0, \infty)$
2. Find the critical values of  $f(x) = 2x^3 - 15x^2 + 36x + 7$

### 3 Section 5.3

1. Determine where the function  $f(x) = x^3 - 3x^2 + 5$  is increasing, decreasing, concave up, and concave down.
2. Find the horizontal and vertical asymptotes, intervals of direction, and intervals of concavity for  $f(x) = \ln |1 - x^2|$  and sketch the graph.
3. Determine where the function  $f(x) = x^2 e^{-2x}$  is increasing, decreasing, concave up, and concave down.
4. Find the inflection points of  $f(x) = -x^2 \cos x + 6 \cos x + 4x \sin x$ ,  $x \in [-\pi, \pi]$ .